Do ecolabels lead to better environmental outcomes in the international shipping industry?

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Abstract

We examine ecolabels' environmental effectiveness in the context of the international shipping industry. Shipping faces major environmental challenges, and has recently witnessed the introduction of several ecolabels aiming for better environmental outcomes. Extending the ecolabel literature into a mature service industry with global operations, we show that concerns about ecolabel environmental effectiveness also have relevance here. Shipping ecolabels fall short of best practices for design and governance. Our study has policy implications for the achievement of better environmental outcomes in the shipping industry.

Highlights

- We study the environmental effectiveness of ecolabels in the shipping industry
- In terms of design and governance ecolabels fall short of best practices
- Stakeholder aims differ and this reduces ecolabel effectiveness
- The full potential for better environmental outcomes is not achieved
- Concerns about ecolabel environmental effectiveness are also relevant for services

Keywords: Ecolabels; Shipping industry; Environmental governance; Corporate environmental disclosure

1. Introduction

The environmental footprint of the international shipping industry is a source of increasing global concern. It includes challenges such as oil spills, toxic hull paints and waste and garbage handling, which have been subject to international policy discussions since at least the 1960s (Mukherjee & Brownrigg, 2013). Within the last two decades, several other challenges, including global climate changes (Asariotis & Benamara, 2012; Smith et al., 2014), air pollution (Brandt et al., 2013; Chatzinikolaou & Ventikos, 2015; Tzannatos, 2010; Viana et al., 2014; Wang, Corbett, & Winebrake, 2007), invasive species (Bax et al., 2001; Briski, Ghabooli, Bailey, & MacIsaac, 2012; Chan, Bailey, Wiley, & MacIsaac, 2013; Dibacco, Humphrey, Nasmith, & Levings, 2012; Molnar, Gamboa, Revenga, & Spalding, 2008), underwater noise (Slabbekoorn et al., 2010), recycling (Hiremath, Tilwankar, & Asolekar, 2015), and interactions with marine mammals (Vanderlaan & Taggart, 2007) have entered the environmental protection agenda of the industry. While shipping shares most challenges with onshore industries (such as other transport modes, power plants and manufacturing), it has generally addressed them relatively late (Lister, Poulsen, & Ponte, 2015). Moreover, forecasts indicate that CO_2 emissions and air pollutants such as nitrogen oxides (NOx) and particulate matter (PM) are likely to rise in the coming decades (Smith et al., 2014), and studies have called for further action to decarbonize the industry (Anderson & Bows, 2012; Bows-Larkin, 2015; Walsh, Mander, & Larkin, 2017). Accordingly, the circumstances under which better environmental outcomes can occur in shipping receive increasing attention from maritime scholars (DeSombre, 2006; R.R. Hermann, 2017; Roberto Rivas Hermann & Wigger, 2017; Lai, Lun, Wong, & Cheng, 2011; Lister et al., 2015; Mander, 2017; McKinnon, 2014; R. T. Poulsen, Ponte, & Lister, 2016; Rahim, Islam, & Kuruppu, 2016; Rehmatulla & Smith, 2015; Rojon & Dieperink, 2014; Wuisan, van Leeuwen, & van Koppen, 2012) and the question remains unresolved.

Since the early 2000s, shipping has witnessed the emergence of several ecolabels aiming for better environmental outcomes. Ecolabels are designed to provide environmental guidance for stakeholders, and incentivize improvement efforts. In the words to the Sustainable Shipping Initiative (SSI), a shipping NGO:

> "Most rating schemes are designed to enable comparison between ships, services or fleets, to allow business customers to select and reward best performers, and for ship owners/operators to differentiate themselves in the market. Other schemes have linked up with ports and offer benefits, such as reduced port fees." (SSI, 2013)

The shipping industry is a relatively late adopter of ecolabels (R. T. Poulsen et al., 2016). Fisheries and forestry were among the first to do so around 1990 (Guldbrandsen, 2005, 2009), and several have followed suit(Arnold & Hockerts, 2011; P. H. Howard & Allen, 2010). An extensive literature has discussed the extent to which ecolabels contribute to better environmental outcomes (Eden, 2009; Schepers, 2010; Wingate & McFarlane, 2005). Ideally, labels can provide buyers with environmental benchmarking tools and enable them to make informed procurement decisions, which acknowledge the environmental footprint of a particular product. Sellers can differentiate their products, gain market shares and create new markets based on high environmental performance. However, several studies have questioned whether ecolabels achieve better environmental outcomes (Eden, 2009; Guldbrandsen, 2009; Schepers, 2010). Consumers' willingness to pay for ecolabel products, when prices exceed the average, has been questioned (Dauvergne & Lister, 2010). Likewise, corporate responses to ecolabels have been debated, as corporations might use them to deflect regulation or provide confusing or irrelevant information to the market place (Schepers, 2010). Some scholars argue for a need for regulation of ecolabels in order to ensure better environmental outcomes (D'Amico, Armani, Gianfaldoni, & Guidi, 2016).

Most research has been directed towards sectors with early adoption of ecolabels such as extractive and consumer goods industries. In the context of shipping, which faces several environmental challenges and has seen several ecolabels emerge in recent years, the question of ecolabel environmental effectiveness has not been thoroughly examined. In this paper, we extend the discussion on ecolabel effectiveness into the context of the international shipping industry, investigating the following research question:

Do ecolabels lead to better environmental outcomes in the international shipping industry?

We shed new light on the circumstances, under which better environmental outcomes can be expected to occur in the shipping industry. In studying shipping, we extend the ecolabel literature into a mature service industry with highly global operations. Such industries have been neglected by the ecolabel literature so far. For shipping, maturity is evidenced by the fact that the main ship types have existed for several decades, and technological developments for ship designs have largely been incremental in the same period (Stopford, 2009; Wijnolst & Wergeland, 2009).

Our study is structured in the following way. First we present a literature review on the best practices for the design and governance of ecolabels. Then we present our methods and data. In section 4 we analyze shipping ecolabels and assess them in the light of the best practices from other industries. In section 5 we discuss our findings, and in section 6 we present our conclusion and the implications of our study.

2. Literature review

2.1. Best practices for ecolabels

An extensive literature has discussed the environmental effectiveness of ecolabels, and possible causes for the failure to achieve better environmental outcomes. For instance, with reference to the Marine Stewardship Council's MSC ecolabel, Ponte (2008 p. 171) argued that, it "…is not simply a non-political, neutral, and scientific tool against over-fishing… It is achieved in the context of global and local competition, special interest battles, and local politics." Auld et al. (2008) have argued that the stakeholders' motivations for engagement with ecolabels can indicate environmental effectiveness (of lack of such). Motivations can range from the creation of market differentiators or new markets to policy deflection and deliberate information overload to the market place. In the first two cases, better environmental outcomes are more likely to occur than in the latter two. Therefore, it is important to study the motivation for engagement among ecolabel stakeholders. We follow suit below.

A recent study by Baumeister and Onkila (2017) on the potential for ecolabels in aviation is particularly relevant, because aviation and shipping share key characteristics as service industries with global operations. Baumeister and Onkila (2017) argued that a number of design and governance dimensions are critical to the success of an ecolabel in aviation. We follow their call and investigate both design and governance dimensions in our analysis. After two decades of ecolabel research, some best practices for ecolabel governance and design have crystalized from the literature (Table 1). With regard to the design dimension, the ideal is *universality* in the form a global recognition of only one ecolabel. If several ecolabels with partly overlapping aims exist, buyers will have difficulties distinguishing between the benefits of each label, and sellers will also face the same confusing situation (Moog, Spicer, & Böhm, 2014). Competition between labels for members or users might water down ecolabel criteria and reduce environmental effectiveness (Moog et al., 2014; Schepers, 2010). The literature also emphasizes *transparency* regarding the environmental footprint, which requires data for benchmarking of environmental performance of different products and corporations (Eden, 2009; Thrane, Ziegler, & Sonesson, 2009; Wingate & McFarlane, 2005). With regard to governance, *credibility* is crucial. Data should be verified by a professional third party (Eden, 2009; Kaiser & Edwards-Jones, 2006; Moog et al., 2014; Schepers, 2010; Wingate & McFarlane, 2005). Finally, engagement from all relevant stakeholders is critical for *legitimacy* (Eden, 2009; Ponte, 2008). This also includes civil society participation in the label (Christian et al., 2013).

Table 1. Best practices for ecolabels

Dimension	Criteria	An ecolabel should…	Key references
Design	Universality	… be universally recognized	(Moog et al., 2014; Schepers, 2010)
	Transparency	… allow for environmental benchmarking of a product or service	(Eden, 2009; Thrane et al., 2009; Wingate & McFarlane, 2005)
Governance	Legitimacy	… enjoy widespread stakeholder support	(Christian et al., 2013; Eden, 2009; Ponte, 2008)
	Credibility	… be subject to third party data verification	(Eden, 2009; Kaiser & Edwards-Jones, 2006; Moog et al., 2014; Schepers, 2010; Wingate & McFarlane, 2005)

2.2. Literature on corporate environmental disclosure in shipping

While the question of ecolabel environmental efficiency has not been directly addressed in shipping industry studies, a number of articles have addressed questions pertaining to environmental disclosure practices in the industry and are relevant to discuss in the context of ecolabel effectiveness.

A number of studies have examined environmental strategies of shipping companies. Lai et al. (2011 p. 631) defined Green Shipping Practices (GSPs) as “environmental management practices undertaken by shipping firms with an emphasis on waste reduction and resource conservation in handling and distributing cargoes” and suggested a positive relationship between such practices and shipping company competitiveness. In contrast, van Leeuwen and van Koppen (2016) concluded that shipping companies predominantly employ “crisis-oriented” environmental strategies, in which compliance represents the highest ambition. Rahim et al. (2016) followed this line of reasoning in a critique of corporate disclosure practices for CO_2 emissions among the eight largest container lines. They concluded that emission reductions can be achieved, if shipping companies will be required by law to disclose information on CO_2 performance. In the following, we will examine if shipping companies use ecolabels to differentiate their services, in order to understand if some shipping companies see environmental performance as a source of competitive advantage.

Wuisan et al. (2012) made a case study of the Clean Shipping Project (CSP), which has developed the Clean Shipping Index (CSI), an ecolabel. While still in an early stage of development, the CSP had a "promising" outlook. Since environmental regulation in shipping was "not sufficient to uncouple growth in shipping from environmental harm" (p. 171), the CSP was a "welcome initiative", which could contribute to environmental improvements. Wuisan et al. suggested that the project should broaden the collaboration and include ports and investors as members. They also advised alignment with regulation from the International Maritime Organization (IMO) and the European Union (EU) in order to avoid conflicts and unnecessary overlaps. Below we examine if alignment has been achieved and if ports and investors have joined five years after the publication of Wuisan et al.'s study.

A few studies have focused on the role of shippers or cargo-owners in the greening of shipping. In a survey study, McKinnon examined shippers' influence on carbon emissions from container shipping, and concluded that: "Very little consideration is currently given to differences in environmental performance in the selection of deep-sea carriers, despite the fact that benchmark data is now available on the carbon intensity of particular container services on specific trade lanes." (McKinnon, 2014 p. 17). Poulsen et al. (2016) documented significant segment differences with regard to shippers' environmental expectations. In container shipping, cargo-owners increasingly ask carriers questions regarding CO_2 emissions, while cargo-owners in other segments only focus on oil spill prevention (tankers), or show very little interest in environmental performance (dry bulk). They concluded that (p. 57) "…environmental upgrading in shipping is not likely to materialize without clear and enforceable global regulation and stronger alignment between regulation and voluntary sustainability initiatives." Finally, Schniederjans and Starkey (2014) examined factors which influence end-consumers' willingness to pay for 'green' transport of T-shirts, concluding that organizations and governments should improve the conditions for marketing of green transportation.

In the maritime energy efficiency literature corporate environmental disclosure has also been addressed. Studies have examined questions pertaining to data on ships' fuel consumption, which is linearly related to CO_2 emissions. Agnolucci et al. (2014) and Adland et al. (2017) asked if energy efficient Panamax dry bulk carriers receive a premium in the time-charter market, and both concluded that the financial savings from energy efficiency do not fully accrue to ship owners. This reduces the ship-owners' incentives to invest in energy savings and hamper emission reduction efforts. In booming freight markets, Adland et al. (2017) even showed that fuel-inefficient ships attract a premium. The two articles pointed towards lack of data on fuel consumption as a possible explanation for these counterintuitive findings. If fuel savings are difficult to verify and inadequate information available, charterers are reluctant to pay a premium. This explanation aligns with conclusions reached by Poulsen and Johnson (2016) in a study on energy efficiency in ship operations. They documented widespread challenges with the collection and analyses of fuel consumption data, and confirmed that lack of energy efficiency information within shipping organizations and in shipping markets lead to unnecessary fuel consumption and emissions. Ideally ecolabels could provide such information, guiding energy efficiency investments and leading to better environmental outcomes. Below we will investigate if this this is the case.

3. Methods

Any study examining a causal link between ecolabels and environmental outcomes faces the methodological challenge of separating the effects of ecolabels from those of other factors. In cases where better environmental outcomes occur, they may be attributed to other factors than ecolabels (e.g., new regulation or innovation). In industries with a relatively short experience with ecolabels, such as shipping, any positive environmental effect must be of a very recent date. However, from studies in other sectors, best practices for ecolabels (as described in section 2) have crystalized, and these can be applied to the study of shipping ecolabels. We assess to what extent these best practices are followed by shipping ecolabels. If labels fail to follow the best practices, their environmental effectiveness is likely to be reduced.

We assess a total of five ecolabels, which we have identified from the SSI's web-site list of shipping ecolabels (SSI, 2016). Our data sets come from the ecolabels' web-sites as well as articles published in a global shipping newspaper, *Lloyd's List*. We use the web sites to illuminate both design and governance dimensions of each ecolabel. On the design dimension, we identify how environmental performance is measured and benchmarked (the question of transparency), and whether one ecolabel is globally recognized (the question of universality). On the governance dimension (i.e. the questions of legitimacy and credibility), we can identify the main stakeholders, as well as possible third party verifiers. The ecolabel web sites do not allow us to identify potential hidden agendas among participating stakeholders, but the enable us to assess if relevant stakeholders are missing from their member lists.

While the web-pages provide valuable information on design and governance dimensions, they do not allow us to fully answer the question of legitimacy, including stakeholder motivation for ecolabel participation. Therefore, we analyze articles from the electronic archives of *Lloyd's List* for the period 1990-2017. We use the following search words to identify relevant articles: Environmental Ship Index/ESI, Clean Cargo Working Group/CCWG, Rightship, Shippingefficiency.org, Clean Shipping Index/CSI, Green Award, and Monitoring Reporting and Verification/MRV, and identify ship-owner perspectives on each ecolabel.

Since, new regulations from the EU and IMO concerning standards for corporate disclosure of CO_2 emissions, so-called Monitoring, Reporting and Verification (MRV) (as will be discussed in Section 4.3) will soon enter into force, we also investigate the web-pages of the two organizations. We identify MRV data requirements and examine if the ecolabels and regulation align in terms of in terms of data requirements (the question of transparency).

4. Analysis

4.1. Design

4.1.1. Universality

Ideally one ecolabel enjoys global or at least very widespread recognition within an industry. In shipping, however, such universality has not been achieved. At least five shipping ecolabels hold a global ambition: Environmental Ship Index (ESI), Clean Cargo Working Group (CCWG), Clean Shipping Index (CSI), Green Award and Existing Vessel Design Index (EVDI, from Rightship/Shippingefficiency.org). Their aims – providing environmental guidance to cargo-owners/charterers, shipping companies, port authorities, financiers and other stakeholders – are partly overlapping and they have developed partly competing environmental benchmarking methodologies.

Recently, the CSI and CCWG investigated the possibility of establishing “one global initiative”. Both boards have come “…together on numerous occasions, though have not reached resolution on key points.” (CCWG, 2016 p. 8). The reason for this divergence and the existence of five ecolabels is related to the different stakeholders, who have only partly overlapping aims. The lack of universality forces all stakeholders to select between ecolabels, and this is likely to reduce environmental effectiveness.

4.1.2. Transparency

Measuring the environmental footprint of shipping is a challenge for all ecolabels. Some environmental challenges are related to fuel consumption and others are not. Largely, shipping ecolabels focus on fuel consumption and air emissions. In 2011, Rightship, a vetting company owned by three major dry bulk cargo-owners, and Shippingefficiency.org, an NGO associated with the Carbon War Room, introduced the EVDI to compare “a ship’s theoretical CO_2 emissions relative to peer vessels of a similar size and type using an easy to interpret A-G scale” (Rightship, 2017a). It is calculated based on principles, which were developed by IMO for the Energy Efficiency Design Index (EEDI). EEDI specifies a minimum energy efficiency level for all new ships in design condition (delivered from 2013) (IMO, 2017b). EVDI applies the same calculation principles to older vessels, based on data from various sources, including classification societies, engine manufacturers, IMO publications and ship-owners. Data verified by classification societies is seen as the best quality data (Rightship, 2017a). Given the theoretical nature of the calculation, EVDI does not provide full transparency regarding ships’ actual energy efficiency and CO_2 emissions, which depends on operational decisions.

The CCWG also focus on CO_2-emissions, but is limited to container shipping. In container shipping, environmental benchmarking is particularly challenging because of container lines’ widespread use of third party feeder services, vessel sharing agreements and repositioning of empty containers (CCWG, 2015). The CCWG has developed a methodology to benchmark CO_2 performance for carriers on specific trade lanes (e.g., Asia – Northern Europe) and individual ships in the same trades. Transparency with regard to CO_2 performance for ships and companies is high, but data sets are only available for CCWG members.

The CSI is also a “cargo owner driven” scheme (Clean Shipping Index, 2015 p. 3) and aims to develop into a “ticket to trade” (Clean Shipping Index, 2015 p. 3). It is not limited to a particular shipping segment. Ships and companies are rated on five steps based on their performance on five environmental issues – including CO_2, air pollution (Sulphur Oxides (SOx), PM and NOx), use of chemicals and waste handling (Clean Shipping Index, 2017b). CSI has the broadest definition of environmental performance among the eco-labels, and provides a relatively high level of transparency for environmental benchmarking, but only for its members. It also accepts CCWG CO_2 methodology for container ships.

Two ecolabels have been developed by service suppliers to the shipping industry: The ESI from the World Port Climate Initiative (WPCI) and the Green Award from the Green Award Foundation. The

ESI was initiated by a group of port authorities (the WPCI) in 2008 mainly due to concerns about local air pollution, which can threaten their social licenses to operate. They have developed ESI to incentivize air pollution abatement from ships in ports (WPCI, 2017). ESI scores are mainly based on air pollution reduction (SOx, NOx and PM emissions). Ships with scrubbers or other exhaust gas cleaning devices, or onshore power systems installed achieve high scores. Scores, however, are granted regardless of the operation of these exhaust gas cleaning devices (ESI, 2017b). In other words, the ESI does not allow for benchmarking of ships' operational performance.

Established by the Port of Rotterdam and the Dutch Ministry of Transport in 1994, the Green Award was developed to incentive improved ship safety, mainly for tankers. It became an independent organization in 2000, and earns revenue from certification of tankers and bulk carriers – or in its own words it "certifies ships that are extra clean and extra safe."(Green Award, 2017d). Originally focused on safety and oil spill prevention, the original Green Award certificates concerned vessel maintenance, crew training and safety procedures – or in the words of Lloyd's List "make supertanker owners more environmentally aware" (Lloyd's List, 1993). More recently, the audit also includes questions on shipping company measures to reduce air pollution and CO_2 emissions and shipbreaking policies (Green Award, 2017b). The certification scheme, however, is not a tool for environmental benchmarking of ships, which either receive a certified or fail. A list of certified vessels is published on the foundation's web-page(Green Award, 2017a). Therefore, it does not provide transparency to the market place on individual's ships environmental performance.

Different definitions of environmental performance challenge efforts for environmental improvements. While air pollutants are the focus of port initiatives, cargo-owners are largely focused on greenhouse gasses (with the exception of CSI). Both challenges are related to ships' fuel consumption, but solutions do not come simultaneously. Scrubbers for SOx reduction and NOx abatement technologies achieve high scores in the ESI. However, they consume fuel and increase CO_2 emissions. Onshore power systems, which are also incentivized by ESI, allow ships to plug into onshore electricity grids while at berth and reduce local air pollution. Their effects on climate, however, depend on electricity power source. Finally, LNG, which is incentivized by port ecolabels, reduces air pollution, but in the best case, CO_2 emissions are reduced by only a few per cent (Brynolf, Baldi, & Johnson, 2016).

The environmental footprint of shipping is broad, and ecolabels largely ignore challenges, which are not related to air emissions. Ballast water management addressing invasive species has only been included in CSI scores, and with the expected entry into force of the IMO Ballast Water Management Convention CSI has dropped it (Clean Shipping Index, 2017b). While highly debate within the pages of Lloyd's List, the question of ballast water management is therefore left entirely in the hands of policy makers (Adamopoulos, 2017b, 2017c). Invasive species are also spread from hull bio-fouling, which is currently not addressed (Lister et al., 2015). Other environmental challenges, such as underwater noise and accidental interactions with marine mammals, are neglected by all shipping ecolabels. Likewise, the environmental footprint of maritime transportation associated with end of life-cycle of ships is neglected. An estimated 85 % of the world fleet is recycled on beaches in Bangladesh, India or Pakistan, involving significant environmental challenges related to the handling of hazardous materials (Demaria, 2010). The IMO has developed the Hong Kong Convention to address these challenges, but it has not entered into force (IMO, 2017c). Among the ecolabels, only CSI specifically mentions recycling, but it does not include it in the calculation of scores (Clean

Shipping Index, 2017b). For the ecolabels, the life-cycle perspective is complex, because the decision on where and how to recycle a ship is often taken by other owners than the current one, and ships often change hands (Alcaidea, Piniella, & Rodríguez-Díaza, 2016).

4.2. Governance

4.2.1. Credibility

CSI's data sets are fully subject to third party verification by classification societies (CSI 2017). In some cases CCWG members' data are also verified by third parties, but members are also allowed to submit data, which has not been verified in this way (CCWG, 2016). ESI data set are based on ship-owner self-assessment, although the WPCI holds the right to audit data (ESI, 2017a). Finally, credibility for EVDI is questionable, since data sets are derived from many sources, some of which are not third party verified (Rightship, 2017a).

Finally, the Green Award foundation certifies ships, based on onboard audits and ashore every three years (Green Award, 2017c), which means that the certificates have high credibility.

4.2.2. Legitimacy

Since 2010 the CCWG has aimed for and succeeded in gaining increasing support for its CO_2 emission benchmarking methodology in container shipping. App. 85% of global ocean container capacity is represented by the CCWG, and 22 large branded cargo-owners and freight forwarders were CCWG members in 2016. While 22 is a low number compared to the total number container shipping buyers, the container volumes of these cargo-owners are large. CCWG gather data for approximately 3,300 container ships (CCWG collaborative progress report 2016) out of world total of 5,200 (UNCTAD, 2016).

EVDI data for 76,000 ships are publicly available, free of charge, and thus covers the largest number of ships of any eco-label. In April 2016, "39 charterers representing 20% of global trade, factor energy efficiency into their decision-making through RightShip's GHG Emissions Rating" and 12 ship-owners "utilize the GHG rating to demonstrate the benefits of investing in efficiency"(Rightship, 2017a). 12 ship-owners represent a miniscule share of the global ship-owner community, and it is unclear how much weight the 39 charterers put on the EVDI for their procurement decision. It is clear however, that the EVDI has received considerable attention in the pages of Lloyd's List, where ship-owner skepticism is very pronounced (Eason, 2012a, 2012b, 2013a, 2013b; Leander, 2012). Concerning EVDI, Rob Lomas, Secretary-general of Intercargo, an international ship-owner association, was quote for the following:

> "What we do not want is yet another simplistic and inaccurate rating system which fails to take into account the progress made at IMO and which merely loads additional costs into the entire supply chain for no conceivable environmental benefit." (Eason, 2012a)

Established in Sweden in 2008, with public support, CSI remains a largely Swedish initiative. All board and technical committee members are Swedish, and the cargo-owner members, who pay an annual fee for membership, are to a large extent based in Sweden (Clean Shipping Index, 2017a). There is no indication of NGO participation. In Lloyd's List, CSI has attracted very little attention -for a few exceptions see: (Eason, 2011, 2014a; Hailey, 2012; Lloyd's List, 2012), and was only mentioned once, since June 2014(Than, 2016). The current number of vessels included in CSI is not available on the label web-page, but in 2013, approximately 2,000 vessels were included (SSI, 2016). This evidence suggests only modest diffusion in the industry. While fulfilling the transparency and credibility criteria, the CSI has not achieved broad legitimacy.

In the case of ESI, a total of 50 organizations use the eco-label to provide incentives to shipping companies in the form of reduced port and fairway dues(ESI, 2017c). Although some major ports and the Panama Canal are incentive providers, the ESI does not enjoy wide support in the port sector. As of April 1, 2017, 5,500 ships out of the world fleet of more than 49,000 vessels (of 1,000 GT or above) were enrolled in the ESI, and data are available on the WPCI webpage (ESI, 2017d). ESI was only mentioned three times – in brief – in Lloyd's List since May 2014, indicating that most ship-owners do generally not show much interest in the scheme (Baker, 2015; Lloyd's List, 2015, 2016).

In the case of Green Award, certified ships are granted reduced port fees by 34 port authorities around the world, and the total number of certified ships stood at 248 in July 2017 (Green Award, 2017a), in 2010 the number was 234 (Green Award, 2010). Green Award incentive providing ports and certified ships represent only a minor shore of the port sector and the world fleet, respectively.

While the ecolabels argue that they can be used by shipping companies for service differentiation (Clean Shipping Index, 2017a; Rightship, 2017c), evidence for such is absent within the pages of Lloyd's List, where EVDI is portrayed as "controversial", and CCWG, CSI, ESI and Green Award receive only little attention. Shipping companies still appear to be reluctant with regard to investments in costly technologies such as exhaust gas cleaning, cleaner marine fuels, and energy efficiency(Yep, 2017). Even in consumer-facing niches in ferry and cruise shipping (Stopford, 2009), we could not find evidence of shipping companies using ecolabels for service differentiation. Passenger shipping companies are not mentioned on ecolabel member lists or in ecolabel articles in Lloyd's List.

The ecolabel literature suggests that broad stakeholder participation is critical for ecolabel environmental effectiveness. In shipping, the two key stakeholders, ports and cargo-owners engage in ecolabels for different reasons – concern about local air quality and global climate change, respectively – and pull in different directions. This is likely to reduce the effectiveness of the schemes. It is notable that other stakeholders are largely absent from ecolabel discussions. Financiers, only mentioned by Rightship/Shippingefficiency.org and CSI (Clean Shipping Index, 2017c; Rightship, 2017b), are crucial in a very capital intensive industry, but do not appear to play any significant role in the development and use of ecolabels. On January 25, 2016, an article with the title "Anthony Veder secures first certified 'sustainable' shipping loan", was published in Lloyd's List (Than, 2016). It explained how one newbuilding for the shipping company, Anthony Veder, was evaluated by a shipping bank in terms of the environmental performance of the vessel design according to the CSI, before a loan was granted. The event was so rare that it deserved mentioning in the shipping press. Ecolabels could guide investments (for instance identifying energy-efficient ships), but this does not seem to be the case at the moment. CSI, CCWG and ESI do not have financiers as members. Likewise, environmental NGOs are remarkably absent from the ecolabel member lists, suggesting that shipping ecolabels have not achieved broad legitimacy among stakeholders. Low legitimacy is likely to reduce environmental effectiveness.

4.3. Regulation corporate environmental disclosure

Despite the existence of ecolabels, the EU and IMO are introducing new regulation, requiring shipping company CO_2 disclosure, so-called Monitoring, Reporting and Verification schemes (MRV). Aimed at enhancing environmental transparency, the MRVs require shipping companies to improve their collection of data on fuel consumption and provide more information to the public on their CO_2-emissions. The EU scheme is the more ambitious of the two, and applies to all ships calling at EU ports from 2018. It requires collection of ship fuel consumption data (and therefore CO_2 emissions) on a per voyage basis. Transport work, in the form of distance travelled and cargo carried, is also required (European Commission, 2017), allowing for assessments of individual ships' CO_2 performance (i.e. emissions relative to transport work). The IMO scheme just requires reporting of fuel consumption, ship capacity (deadweight) and distance travelled, but not cargo carried ((IMO, 2017a), thus missing information on CO_2 performance. It remains to be seen if or how IMO and EU systems can be harmonized (Adamopoulos, 2017a).

For IMO, the MRV represents an advancement of the Ship Energy Efficiency Management Plan (SEEMP), which became mandatory for all ships in 2013. SEEMP was introduced in order to spur shipping companies to engage in energy efficiency measures. It requires all ships to carry a plan for energy management and was seen by IMO as an energy efficiency enhancement tool (IMO, 2017d). However, Poulsen and Johnson (2016) indicate that the mandatory SEEMP had little practical impact on behavior in shipping companies.

At a certain point in time, there were also discussion on including air pollutants in the EU MRV scheme, but this was dropped(Eason, 2014b). Air pollutants are not always linearly related to fuel consumption, but depend on different operational conditions. The EU MRV has been associated with controversy. In Lloyd's List, many ship-owners and the International Chamber of Shipping, representing more than half of the world's ship-owners, were concerned that the regional EU MRV with the inclusion of transport work would "distort" the market. Ship-owners argued that such an MRV would require them to reveal commercially sensitive information and create administrative burdens. Moreover, ship-owners felt that they were not always in control of transport work, and therefore this information should not be shared(Eason, 2014c; Grey, 2014; G. Howard, 2016a, 2016b). They were also critical against a regional EU measure, instead of a global one. The MRV controversy illustrates that a major share of the international ship-owner community does not embrace idea of enhanced transparency on fuel consumption, and it remains to be seen how the MRV will affect environmental transparency in the market place. In their 2016 progress report(CCWG, 2016 p. 8), the CCWG stated that they would "engage with regulatory standard-setting bodies (e.g., EU MRV)", it is unclear what the outcome was. Ecolabels can potentially use MRV data, which would provide alignment between public and private initiatives, and probably lead to better environmental outcomes. It remains to be seen how the MRVs and ecolabels will interact.

5. Discussion

Do ecolabels lead to better environmental outcomes in the shipping industry or fail in their promises? Best practices with regard to ecolabel governance and design (universality, transparency, credibility and legitimacy) are not fulfilled, and therefore the full potential for better environmental outcomes is most likely not achieved. To the extent that shipping ecolabels do provide a basis for better environmental outcomes, those are restricted to air emission abatement.

A couple of years ago, Wuisan et al. (2012) saw a “promising” outlook for the Clean Shipping Project and called for a broadened collaboration between shipping companies, shippers, ports and investors. We provide an update, indicating that the proposed collaboration has not materialized. Cargo-owners and ports have developed separate ecolabels, and do not exercise a joint or uniform environmental pressure on shipping companies. Our study also resonates with Rahim et al. (2016) critical assessment of CO_2 disclosure of in container shipping. Within the pages of Lloyd’s List, we could not find much evidence that shipping companies use ecolabels as a differentiator in the market. This also aligns with Van Leeuwen and van Koppen (2016) observations on “crisis-oriented” environmental strategies in shipping companies. We could not find evidence to support the positive relationship between environmental protection and corporate performance suggested by Lai et al. (2011) suggested. Credible environmental benchmarking with high legitimacy has not been achieved for the entire world fleet.

Wuisan et al. (2012), Lister et al. (2015) and Poulsen et al. (2016) have advocated for alignment of ecolabels and regulation on corporate environmental disclosure to avoid conflicts, confusion and unnecessary overlaps. The IMO and EU are introducing MRVs, and it remains to be seen if they will align in practice. A widespread ship-owner skepticism regarding the EU MRV system suggests that many ship-owners are still in doubt about the advantages of environmental benchmarking in the market place.

With the energy efficiency literature, Agnolucci et al. (2014 p. 183) concluded that: “Any instrument facilitating the diffusion of information or reducing the costs of holding ship owners accountable to their energy efficiency claims will help increase the maximum amount that time charterers are will to pay for the increased energy efficiency and stimulate the uptake of energy efficiency investments.” While the ecolabels with focus on CO_2emissions do represent a step in this direction, their diffusion (perhaps with the exception of container shipping) is insufficient to provide credible energy efficiency information in the market place.

In their study of ecolabels for airlines, Baumeister and Onkila (2017) focused entirely on fuel consumption and CO_2emissions as an environmental performance metric. Shipping has a multifaceted environmental footprint, but ecolabels focus predominantly on air emissions, which are directly related to ship operations. Accidental challenges (invasive species, oil spills, interaction with marine mammals) and end-of-life-cycle problems (recycling) are largely neglected by shipping ecolabels.

Our study adds two important insights to the ecolabel literature, which has neglected mature service industries with global operations such as shipping. Firstly, it shows that some of the concerns about ecolabel environmental effectiveness identified elsewhere also have relevance for a service industry. If ecolabels do not provide full transparency, and achieve strong credibility and legitimacy, the achievement of better environmental outcomes will also be hampered in services. Secondly, maturity – as reflected by technological stability and standardization – does not guarantee that better environmental outcomes occur, when ecolabels are introduced. Better environmental outcomes in mature industries still depend on the close collaboration between all relevant stakeholders. As long as ports and cargo-owners pull in different directions, and public and private transparency initiatives are not fully aligned, the full potential for better environmental outcomes is not likely to be achieved.

Conclusion

The environmental effectiveness of ecolabels has been a matter of debate since their introduction in fisheries and forestry around 1990. Ideally ecolabels provide buyers and sellers with relevant environmental information, and incentivize environmental improvements. However, companies might use them to deflect regulation or create information overload in the marketplace, in which case improvements will fail to materialize. We extend the ecolabel literature into the shipping industry, a mature service industry with global operations, which has largely been neglected by this literature. Shipping faces several environmental challenges – including climate changes, air pollution, invasive species and recycling – and has witnessed the emergence of several ecolabels since the early 2000s. We evaluate, if shipping ecolabels lead to better environmental outcomes.

A relatively late ecolabel adopter, the shipping industry can potentially leverage ecolabel experiences from other industries, pertaining to ecolabel design and governance. The ecolabel literature shows that there should be only one ecolabel (universality), and it should provide third party verified data for benchmarking of environmental performance (credibility and transparency). Finally, in order to achieve better environmental outcomes, the ecolabel should enjoy widespread stakeholder support (legitimacy). However, shipping ecolabels largely fall short of the best practices, and this hampers efforts to improve the environmental performance of the industry.

No shipping ecolabel has achieved universal recognition. Instead several, partly overlapping ecolabels exist. Key stakeholders, cargo-owners and ports, are concerned with different challenges. Ports focus on local air pollution, while some container shipping cargo-owners are mainly addressing global climate changes, and therefore pull in different directions. There is little evidence to suggest that ship-owners use ecolabels to differentiate their services, and some ecolabels lack credibility, because they are not verified by third parties. Moreover, some of the labels do not allow for benchmarking of ships' operational performance, as they are mainly concerned with ships in design condition. Some labels have been associated with considerable controversy and lack legitimacy in the ship owner community. Civil society engagement from NGOs, which is important for legitimacy and therefore environmental effectiveness, remains very low.

Both the IMO and EU are introducing new regulation, requiring shipping companies to publicize fuel consumption and CO_2emissions data, indicating that policy makers are dissatisfied with ecolabel achievements. It remains to be seen if ecolabels and MRVs can align in the effort to achieve better environmental outcomes.

For the ecolabel literature our study shows how common concerns about ecolabel effectiveness also have relevance in the context of services. Moreover, technological maturity, as seen in shipping, does not automatically guarantee better environmental outcomes from ecolabels. This requires alignment of private and public initiatives and close collaboration between all relevant stakeholders.

Our study has important policy implications in pointing out circumstances, which could lead to better environmental outcomes in shipping. Firstly, coordination of private initiatives among ports and cargo owners could avoid duplication, enhance environmental transparency and strengthen ecolabel legitimacy. Secondly, alignment between public and private transparency initiatives could enhance transparency. Thirdly, environmental challenges unrelated to ships' air emissions (such as invasive species, recycling and interaction with marine mammals) require further policy attention, because they are neglected by ecolabels.

The topic of corporate environmental disclosure and environmental performance deserves further studies in the context of international shipping. The interaction between public and private initiatives and the environmental effects of the upcoming MRV systems represent a promising area for further research. Longitudinal studies of shipping companies and shipping segments would be relevant to answer the question of how MRV and ecolabels affect individual companies and market dynamics more generally. Studies undertaken before and after the entry into force of the MRV systems promise to shed new light on the circumstances, under which better environmental outcomes would occur in the international shipping industry.

Glossary

CCWG: Clean Cargo Working Group

CSI: Clean Shipping Index

CSP: Clean Shipping Project

EEDI: Energy Efficiency Design Index

EEOI: Energy Efficiency Operational Indicator

EVDI: Existing Vessel Design Index

ESI: Environmental Ship Index

MBMs: Market-based measures

MRV: Monitoring, Reporting and Verification

SEEMP: Ship Energy Efficiency Management Plan

WPCI: World Port Climate Initiative

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